proxim

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 15 of the	)	
Commission's Rules Regarding	)	ET Docket No. 99-231
Spread Spectrum Devices	)	

COMMENTS OF PROXIM, INC.

Proxim, Inc. ("Proxim") enthusiastically endorses the proposals set out in the Notice of Proposed Rulemaking (the "NPRM") adopted in the above-referenced proceeding on June 21, 1999.

In the NPRM, the Commission proposes to make two changes to the rules governing the operation of spread spectrum devices in the 2.4 GHz band (2400 - 2483.5 MHz). First, the Commission proposes to revise the rules for frequency hopping systems to allow for wider operational bandwidths. Second, the Commission proposes to refine the method for measuring the processing gain of direct sequence systems. Together, these actions are intended to facilitate the continued development and deployment of spread spectrum technology, particularly for high data rate wireless applications.[1]

The changes proposed in the NPRM will facilitate increased innovation and competition in the development and use of broadband spread spectrum technologies at 2.4 GHz. Proxim, therefore, supports these changes and urges the Commission to adopt them as soon as possible.

BACKGROUND AND STATEMENT OF INTEREST

According to multiple independent research institutions, Proxim has the world's largest market share in wireless local area networking ("WLAN") devices. In 1998, Proxim accounted for approximately 40% of global WLAN shipments, and its market share specific to the 2.4 GHz band is higher yet. Proxim manufactures both frequency hopping and direct sequence products.

[1] NPRM at para. 1.

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Proxim is a U.S. company. Its products are used on a global basis, in everything from critical patient monitoring devices to whimsical home Internet gaming applications. Proxim sells its core communications devices to over 150 different OEM companies who, in turn, integrate these devices into system level products for end-users. Proxim is an active participant in and supporter of several major wireless data standards initiatives, including IEEE802.11, OpenAir, the HomeRF Working Group (SWAP), Bluetooth and HiperLAN.

In light of the above, Proxim and its customers have a direct interest in regulatory changes that enhance competition and opportunity in the 2.4 GHz band.

DISCUSSION

I. THE COMMISSION SHOULD ADOPT ITS PROPOSED CHANGES TO THE RULES GOVERNING FREQUENCY HOPPING SYSTEMS.

A. Permitting Spread Spectrum Devices To Operate With 3 And 5 MHz Bandwidths Will Make It Possible For These Devices To Meet The Need For High Bandwidth Communications.

As Chairman Kennard stated in a recent speech, promoting the deployment of broadband technologies and services is the most important issue on the FCC's agenda today.[2] Broadband technologies promise to bring about fundamental changes in the ways in which we communicate and, more broadly, in the ways in which we interact with one another as individuals and as a society.

The NPRM's proposed changes to the regulations governing 2.4 GHz frequency hopping spread spectrum devices is one element in the Commission's overall effort to promote the deployment of broadband technologies. By authorizing these devices to operate using 3 or 5 MHz bandwidths, the new rules will make it possible for them to achieve substantially higher data rates than are possible under the current rules.[3] This, in turn, will enable Proxim and its customers to realize a host of benefits, such as faster file transfers, speedier Internet access, and enhanced multi-media experiences.

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[2] Remarks by William E. Kennard, Chairman, Federal Communications Commission, at the National Association of Telecommunications Officers and Advisors 19th Annual Conference, Atlanta, GA (Sept. 17, 1999).

[3] Under the current rules, 2.4 GHz frequency hopping devices are limited to a 20 dB bandwidth of no more than 1 MHz. 47 C.F.R. Section 15.247.

In Proxim's experience, frequency hopping spread spectrum technologies are tailor-made for broadband applications. They are quite resistant to interference and, as a result, are uniquely well-suited to sharing the 2.4 GHz unlicensed band with other communications devices and with ISM devices. This characteristic enables them to put otherwise cluttered spectrum to a highly productive use. In addition, frequency hopping spread spectrum devices consume very little power, making them ideal for use in mobile devices. Overall, frequency hopping technologies provide excellent cost/performance value which makes them ideal for the mass market opportunities envisioned by the HomeRF Working Group.

Frequency hopping spread spectrum systems for wireless in-home distribution of Internet content and services should be part of the FCC's overall broadband effort. In light of their distinctive characteristics, they can help to ensure that the Commission meets each of the four core objectives for the "broadband world" recently outlined by Chairman Kennard:[4]

- **Rapid Deployment.** Unlicensed networks are uniquely suited to rapid deployment, because they are not constrained by licensing requirements or by the buildout plans and resources of any individual service provider. The HomeRF technology, especially with the enhancements possible by the Commission's initiative in the NPRM, will enable broadband service providers to reach more consumers quickly with greater variety of content and services including high quality cordless telephony.

- **Ubiquitous Deployment.** Unlicensed networks evolve from the "bottom up," rather from the "top down." No single service provider dictates when or where they will be deployed. Furthermore, many manufacturers, including suppliers of broadband gateways, home computers, cordless phones, electronic appliances and networking gear, will be able to provide interoperable broadband-based equipment because of the low cost structure of HomeRF technology based on the NPRM.

- **Competitive Deployment.** A truly competitive broadband world will encourage innovation and competition for many companies and technologies. Broadband home networking is possible by dedicated wires, by existing phone or power wires or by a multitude of wireless techniques. The consumer wins from the Commission's NPRM because even more choices for low cost and high speed wireless will now become available.

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[4] Id.

- **Open Deployment.** By broadening the range of options available to all wireless equipment manufacturers and through open intellectual property organizations such as HomeRF, the playing field is leveled for any and all suppliers to compete fairly in providing products that delight the American consumer.

The Commission's proposal to allow 2.4 GHz frequency hopping spread spectrum devices to employ 3 and 5 MHz bandwidths will give these devices the opportunity to be part of the broadband solution. At the same time, these newer high data rate devices will be backward-compatible with the installed base of existing, more narrow-band systems, thereby weaving existing devices into more advanced networks and protecting end users' investments.

B. Adoption Of The Proposed Rule Changes Will Promote Competitive Parity And International Trade.

The rule changes proposed in the NPRM not only will promote the deployment of broadband networks domestically, they also will promote competitive parity and international trade.

The Commission's existing rules for 2.4 GHz spread spectrum devices have introduced a counter-productive distortion into the market for unlicensed devices. Under the current rules, 2.4 GHz direct sequence systems - which routinely use 20 MHz or more of bandwidth at a time - are able to support high speed communications, offering data transfer rates that are comparable to those that would be achievable by 3 MHz and 5 MHz frequency hopping systems. In contrast, frequency hopping devices currently are limited to a 1 MHz bandwidth and, therefore, are unable to achieve these higher data rates. Unless frequency hopping systems are allowed to use 3 and 5 MHz bandwidths, they will remain at a competitive disadvantage and consumers unnecessarily will be denied the benefits of fair competition between frequency hopping systems and direct sequence systems.[5]

In addition, because the proposed rule changes are consistent with existing regulations outside the United States, their adoption will enable manufacturers to build high bandwidth frequency hopping products suitable for use on a global basis. As a result, this action will promote research and development, trade, and U.S. leadership in the global telecommunications marketplace.

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[5] See NPRM at para. 6 (the HRFWG has concluded that frequency hopping high bandwidth services could be implemented at lower costs and with greater interference resistance than existing direct sequence systems operating at comparable speeds).

C. The Proposed Changes To The Rules For Frequency Hopping Systems Will Not Cause Objectionable Interference To Other Users Of The 2.4 GHz Band.

Frequency hopping systems that comply with the proposed rules will not cause additional interference to existing users of the 2.4 GHz band. This point is absolutely critical to Proxim: with an installed base of nearly one million users, and rapidly growing demand for its existing products, Proxim absolutely would not endorse any proposal for rule changes in the 2.4 GHz band that could undercut successful sharing in the band.

As the Commission has concluded, the combination of reduced output power and channel occupancy will overcome any increased interference that otherwise might have been caused by operation at wider bandwidths. As a result, the changes proposed in the NPRM will not result in any significant increase in interference to direct sequence devices or to other existing users of the 2.4 GHz band.[6] In addition, as the Commission also has recognized in the NPRM, manufacturers of direct sequence systems that are concerned about interference can improve the robustness of their systems by increasing processing gain.[7]

Proxim further notes in response to the Commission's request for comments that the substantially lower power spectral density of systems built in accordance with the NPRM will result in reduced interference to radio amateurs compared with existing alternatives.

D. The Commission Should Modify The Proposed Rules To Clarify Overlapping Hopping Channel Descriptions

Specific language recommendations for implementing the proposed frequency hopping rule changes are set out in Attachment A. The changes mainly revolve around the distinction in the proposed rules between the hopping channel bandwidth and the separation of hopping channel carriers and the subsequent duration of occupancy on a given hopping channel carrier.

Proxim offers the suggested changes because some of the terminology in the proposed rules could be interpreted in a manner that would be inconsistent with the Commission's objectives in proposing the rule changes. Proxim's suggested changes are completely consistent with the FCC's proposal for widening channel bandwidths and are unambiguous for manufacturers to follow, which will assure compliance without continued interpretation and oversight of the Commission staff.

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[6] NPRM at para. 9.

[7] Id.

II. THE COMMISSION SHOULD ADOPT THE PROPOSED REFINEMENTS TO ITS METHOD FOR MEASURING THE PROCESSING GAIN OF DIRECT SEQUENCE SYSTEMS.

Proxim supports the Commission's proposal to clarify the testing procedures for direct sequence systems with extremely low chipping rates. The current CW jamming margin test procedure, which largely originated from cooperation between the FCC and Proxim nearly 10 years ago, was never intended to be used with systems employing less than 10 chips per symbol. In cases where chipping rates are very low, the existing test can produce completely erroneous results, as was proven conclusively in the Petition for Declaratory Ruling filed by Micrilor, Inc.[8] Continued use of the CW jamming margin test for such low chipping rate systems unfairly penalizes those manufacturers, such as Proxim, who have chosen to build direct sequence systems that fully comply with the 10 dB processing gain requirement independent of testing anomalies.

Specific language recommendations for implementing the proposed direct sequence rule changes are included herein as Attachment B. Proxim believes as detailed in Attachment B that the best approach is to require the Gaussian noise test as proposed by the Commission for systems with less than 10 chips per symbol. The test limits should be consistent with well known spreading values for existing systems with greater than 10 chips per symbol. A simple Gaussian noise test as described in Attachment B is very easy for manufacturers of direct sequence devices such as Proxim to perform for certification. Since the Gaussian noise test produces equally valid results for any chipping rate, the option should be given to manufacturers to use this superior test method at any chipping rate.

If the Commission decides to allow continued use of the CW jamming margin test combined with a mathematical proof for devices with less than 10 chips per symbol, it is critical that the Commission define the mathematical proof to be consistent with the terms in the jamming margin equation and that implementation losses not be considered for theoretical proofs. However, Proxim remains extremely concerned that the mathematical proof could be subject to considerable abuse and could unnecessarily burden the Commission's staff through difficult interpretations and endless appeals. Proxim believes the far better solution is the adoption of a Gaussian noise test as described in general by the Commission's proposal and specifically in Attachment B. This test is extremely accurate and unambiguous and can easily be verified by independent test labs.

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[8] See NPRM at para. 13.

CONCLUSION

For the reasons stated above, Proxim urges the Commission promptly to adopt the proposals set forth in the NPRM with the rule changes recommended herein. This action will serve the public interest by promoting the flexible, efficient, and equitable use of the 2.4 GHz band by frequency hopping and direct sequence spread spectrum devices.

Respectfully submitted,

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October 4, 1999

Attachment A

Recommended Language for Amended 15.247 Frequency Hopping Regulations

15.247

(a) * * *

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater, *except as noted in 15.247 (a),(1),(ii).* The system shall hop to channel *carrier* frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. * * *

(i) * * *

(ii) Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 75 hopping *channel carrier* frequencies. The 20 dB bandwidth of the hopping channel may be 1 MHz, 3 MHz or 5 MHz. If the 20 dB bandwidth of the hopping channel is 1 MHz, the average time of occupancy on any *hopping channel carrier* frequency shall not be greater than 0.4 seconds within a 30 second period. If the 20 dB bandwidth of the hopping channel is 3 MHz, the average time of occupancy on any *hopping channel carrier* frequency shall not be greater than 0.05 seconds within a 3.75 second period. If the 20 dB bandwidth of the hopping channel is 5 MHz, the average time of occupancy on any *hopping channel carrier* frequency shall not be greater than 0.02 seconds within a 1.5 second period. *If the 20 dB bandwidth of the hopping channel is greater than 1 MHz, the hopping channel carrier frequencies shall be separated by a minimum of 1 MHz.*

(iii) * * *

(b) * * *

(1) For frequency hopping systems in the 2400-2483.5 MHz band:
- (i) 1 Watt if the 20 dB hopping channel bandwidth is 1 MHz.
- (ii) 0.32 Watt if the 20 dB hopping channel bandwidth is 3 MHz.
- (iii) 0.20 Watt if the 20 dB hopping channel bandwidth is 5 MHz.

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Attachment B

Recommended Language for Amended 15.247 Direct Sequence Regulations

15.247

(e) * * *

(3) For systems that employ a spreading rate less than 10 chips/symbol the processing gain *must* be determined by using the jamming margin test procedure described in paragraph (2), *except that the interfering signal used must be Gaussian noise of bandwidth more than 25% and less than 50% of the signal (3-dB) bandwidth and centered on the signal center frequency. This Gaussian noise form of processing gain measurement may also be used for Nc>10.*